

Variability of Radiation Doses Reconstructed by EPR in Teeth of Former United States Nuclear Workers

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The United States Transuranium and Uranium Registries (USTUR) is a research program that studies actinide biokinetics in occupationally exposed individuals with known intakes of these elements [1]. This work is a continuation of our previous study “Electron paramagnetic resonance dose measurements in teeth of tissue donors to the United States Transuranium and Uranium Registries” [2] where EPR in tooth enamel was applied to reconstruct external doses of nine USTUR registrants. Our prior results showed that there was a reasonable agreement between the EPR-measured dose and the worksite external dose record only in two cases. For two Registrants, high EPR doses can be explained by possible cancer radiotherapy. For the remaining five cases, EPR doses significantly exceeded worksite reported doses with no plausible explanation for the observed discrepancy. In an effort to understand causes of this discrepancy, we carried out EPR dose measurements in additional tooth samples collected from the same donors as in the first study [2] to see if reconstructed doses are reproducible. Powderized samples of tooth enamel were prepared using a standard technique and measured by EPR. In order to obtain radiation dose, peak-to-peak amplitude of a radiation-induced signal was related to a calibration curve. Radiation doses in enamel obtained in this study were compared with those reported by worksites and EPR reconstructed doses for the same individuals [2]. Additionally, tooth samples were counted using gamma spectrometry on a high purity germanium detector to measure any internally deposited radionuclides which can cause irradiation of tooth enamel.

Keywords: Tooth enamel; EPR; gamma spectroscopy, plutonium workers; USTUR.

References:

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[2] Romanyukha A., Tolmachev S.Y. *Radiat. Prot. Dosim.*, 199, 1578, 2023.

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USTUR-0672-24A